

REMARKS

Claims 32-55 are pending in the application with claims 49 and 50 amended herein and new claims 51-55 added herein.

Claims 49 and 50 stand rejected under 35 USC 112, first paragraph, as lacking a proper description in the specification. Applicants request reconsideration.

Amended claim 49 depends from claim 33 and sets forth that the encapsulant and the support material together encapsulate the fibers beyond one end of the individual lengths of the plurality of fibers. Pages 2-3 of the Office Action state that the present specification does not disclose a limitation to a "combined thickness" of the encapsulant and support material. However, Applicants note that page 8, lines 25-31 are part of a description extending at least from page 6, line 18 to page 9, line 17 for forming an interface. Such description includes embedding fibers in a support material and applying encapsulant. On page 8, lines 25-31, the interface material (including support material) with uncured gel between fibers is described as clamped to less than the fiber length. The example given is clamping to a height of about 0.017 inches corresponding to a fiber length of about 0.020 inches. Accordingly, the height disclosed in lines 25-31 is the clamping height and it includes both the support material and the encapsulant. The specification thus supports a combined thickness of encapsulant and support material.

The Office Action also alleges that the present specification does not teach "beyond one end of the individual lengths of the plurality of fibers." However, amended claim 49 sets forth that the encapsulant and support material together encapsulate

fibers beyond one end. That is, the encapsulant and support material do not merely encapsulated one end of fibers, rather, they encapsulate fibers "beyond one end." At least Fig. 2 of the present specification supports claim 49 by showing support material and encapsulant that do not merely encapsulate one end of the fibers. In Fig. 2, the support material and encapsulant extend upward beyond one end of the fibers. Claim 49 may be contrasted with Koon '548 that merely provides in column 6, line 13 and elsewhere that fibers are attached "by a first end." Koon '548 does not describe fibers encapsulated beyond the attached first end.

Amended claim 50 depends from claim 33 and sets forth that the encapsulant and support material have a combined thickness encapsulating approximately 85% of the individual lengths of the plurality of fibers. As discussed above with regard to claim 49, the present specification supports such "combined thickness." Also, amended claim 50 now sets forth that the combined thickness encapsulates "approximately 85%" of the fiber length, as supported at least by page 8, lines 25-31 of the present specification discussed above.

In accordance with the discussion herein regarding claims 49 and 50, a proper description of the subject matter of such claims is provided in the present specification. Applicants request withdrawal of the lack of proper description rejection in the next Office Action.

Claim 49 stands rejected under 35 USC 112, second paragraph, as being indefinite. Applicants request reconsideration.

The subject matter of amended claim 49 is described above. The meaning of the claim 49 terms and their definiteness is also largely discussed above in the context of a proper description in the specification. In addition, Applicants note that claim 49 modifies the limitations of claim 33 which in turn modifies the limitations of claim 32. Claim 32 sets forth that the encapsulant has a thickness encapsulating a portion of the fiber length. Claim 33 further sets forth that the fibers are in a support material and the encapsulant is on the support material. Claim 49 still further specifies that the encapsulant and support material together encapsulate fibers beyond one end of the fiber lengths. Accordingly, inherent in claim 49 are the limitations that the fibers are in the support material and encapsulant, and that the encapsulant is on the support material. Such limitations describe relative positioning of the support material, encapsulant, and fibers. Claim 49 is thus definite in setting forth that it is the fibers that are encapsulated "beyond one end of the individual lengths of the plurality of fibers." Fig. 2 of the present specification provides one example of claim 49. More than merely one end of fibers 32 are encapsulated, accordingly, fibers 32 are encapsulated beyond one end. Applicants assert that claim 49 is definite and request withdrawal of the indefiniteness rejection in the next Office Action.

Claims 32-48 stand rejected under 35 USC 103(a) as being unpatentable over Koon '548 in view of Koon '707. Applicants request reconsideration.

Claim 32 sets forth a thermal interface that includes, among other features, an encapsulant and a plurality of thermally conductive fibers forming a thermally conductive composite, an average length of the fibers being greater than an average

thickness of the encapsulant along an average direction of the fiber lengths. Pages 4-6 of the Office Action alleges that Koon ' 548 teaches a portion of fiber lengths embedded in adhesive wherein heat transfer occurs through the exposed portion of the fiber lengths contacting air flow. The Office Action relies on Koon ' 707 as suggesting modification of Koon ' 548 by adding encapsulant. The Office Action essentially alleges that it would be obvious to add encapsulant in such a manner that a conductive pathway is enhanced between a heat-producing material and a heat-dissipating material that can be added, replacing the air circulating around exposed fibers. Even so, page 5 of the Office Action acknowledges that "neither of the Koon references teach the present limitation of an average fiber length greater than an average encapsulant thickness." Instead, the Office Action alleges that combination of the references inherently teaches such limitation. Applicants traverse such inherency determination.

Applicants note that neither of the Koon references provide any information that one of ordinary skill can use to determine a proper thickness for the added encapsulant. Koon ' 548 does not disclose or suggest adding encapsulant and cannot be considered to include any discussion of a thickness for encapsulant. Koon ' 707 merely describes fiber flocking opposing surfaces separately, interdigitating the fibers of a first surface with the fibers of a second surface, and applying a polymer material. Such a teaching does not suggest the encapsulant thickness set forth in claim 32. As an example, column 5, lines 41-45 of Koon ' 707 describe a 100 mil gap and 80 mil fibers with a 60 mil overlap. The fibers are 20 mil less than the encapsulant thickness filling the gap. Also, column 5, lines 27-32 and 45-50 of Koon ' 707 state that even a minimum overlap

of interdigitated fibers will suffice, further widening the gap. The encapsulant of Koon ' 707 is thus intentionally more thick than the fiber length.

Applicants assert that no suggestion or motivation exists to add encapsulant to the device of Koon ' 548. However, regardless of whether such a suggestion exists, clearly no disclosure or suggestion exists of how to add the encapsulant such that the thermal interface of claim 32 necessarily results. That is, neither of the Koon references discloses or suggest adding encapsulant to a thickness such that average fiber length is greater than an average encapsulant thickness. Koon ' 707 expressly teaches an average fiber length less than average encapsulant thickness. Accordingly, it is not seen now combining the references will inherently result in teaching all of the claim 32 limitations. It appears that only the Applicants' specification discloses such a teaching.

"The mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency." In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (citations omitted) (emphasis in original); MPEP § 2112. Further, "[i]n relying upon the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis added); MPEP § 2112. Koon ' 707 expressly teaches average fiber length less than average encapsulant thickness. Even though it may be possible for combination of the Koon references to yield average fiber length greater than average

encapsulant thickness, such an allegation of the Office is not sufficient to establish inherency. The Office has not sufficiently supported a determination that average fiber length greater than average encapsulant thickness necessarily flows from combination of the Koon references. At least for such reason, claim 32 is patentable over Koon ' 548 in view of Koon ' 707.

In addition, the Office has not established a prima facie case of obviousness. The Office must show that the prior art suggests to those of ordinary skill, "that they should make the claimed composition or device, or carry out the claimed process." In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991). That is, the cited combination of references must show that those of ordinary skill should make the thermal interface with an average fiber length greater than average encapsulant thickness. It is not sufficient for the references merely to suggest adding encapsulant to the exposed fibers of Koon ' 548. Also, the motivation for modifying Koon ' 548 to produce the claimed thermal interface must be something other than hindsight reconstruction based on using Applicants' invention as a road map for the modification. See, e.g., Interconnect Planning Corp. v. Veil, 227 USPQ 543, 551 (Fed. Cir. 1985); In re Mills, 16 USPQ2d 1430 (Fed. Cir. 1990) (explaining that hindsight reconstruction is an improper basis for rejection of a claim). Applicants assert that only the Applicants' own specification discloses an advantage to a thermal interface having average fiber length greater than average encapsulant thickness.

Koon ' 707 addresses the problem of thermal conductivity between surfaces with two flocked surfaces and interdigitated fibers within an encapsulant. The thermal

interface of claim 32 accomplishes the same or better thermal conductivity (since there is no reliance on interdigitation) with an average fiber length greater than average encapsulant thickness. Interdigitated fibers are not required. Two flocked surfaces are not required. Neither of the Koon references contemplate that a thermal interface without interdigitated fibers flocked on opposing surfaces can be formed and similar advantages still expected. The Office Action alleges that it would be obvious to add the claimed encapsulant thickness and a heat dissipating device to Koon ' 548. However, no teaching exists in the art of how to add the encapsulant to yield the claimed invention capable of dissipating heat as alleged. A mere suggestion to add encapsulant is not sufficient.

Accordingly, Applicants' contribution to the art is a teaching of the relationship between fiber length and encapsulant thickness such that high thermal conductivity can be obtained without the Koon ' 707 requirement of flocked, opposing surfaces and interdigitated fibers. Applicants' own specification alone provides a teaching of the claimed relationship between fiber length and encapsulant thickness and the advantage of such structure. At least for such additional reasons, claim 32 is patentable over the cited references for the Office's failure to establish a prima facie case showing those of ordinary skill that they should make the claimed device.

Claims 33, 34 and 49-52 depend from claim 32 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. For example, claim 50 sets forth that the encapsulant and support material have a combined thickness encapsulating approximately 85% of the individual lengths

of the plurality of fibers. Neither of the Koon references disclose or suggest the combined thickness encapsulating approximately 85% of fiber length. Also for example, claim 51 sets forth that the encapsulant comprises a gel and claim 52 sets forth that the encapsulant comprises a polymeric gel. Neither of the Koon references disclose or suggest such encapsulants.

Claim 35 sets forth a thermal interface that includes, among other features, a plurality of thermally conductive fibers embedded in a support material, the support material having a first surface and a second opposing surface, the fibers having first portions that extend upwardly out of the second opposing surface of the support material, an encapsulant between the first portions of the fibers, and a third surface defining an outermost surface of the thermally conductive composite except for the fiber first portions terminating in tips that are elevationally above the third surface and the encapsulant. Page 6 of the Office Action alleges that if an encapsulant is added to the flocked substrate of Koon ' 548 that the average fiber length is inevitably greater than encapsulant thickness. Applicants above assert, with regard to claim 32, that such result is not necessarily the case.

In addition, claim 35 specifies that fiber first portions terminate in tips that are elevationally above an outermost surface of the thermal interface and elevationally above the encapsulant. Neither of the Koon references disclose or suggest such a feature. Also, the fiber tips elevationally above the third surface and the encapsulant do not necessarily result from the alleged combination of the Koon references. In addition, neither reference provides any suggestion to those of ordinary skill that they should

modify Koon ' 548 to achieve such a structure. Only the Applicants' own specification discloses adequate teachings needed to produce the claimed invention. At least for such reasons, claim 35 is patentable over the cited references.

Claims 36 and 53 depend from claim 35 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. For example, claim 53 sets forth that the first surface of the support material opposes the third surface of the thermal interface and defines another outermost surface of the thermally conductive composite except for fiber tips, if any, that terminate elevationally below the support material. Also, an average length of the fibers is greater than an average thickness from the first surface to the third surface. Neither of the cited references disclose or suggest the claimed relationship between average fiber length and average thickness between the outermost surfaces.

Claim 37 sets forth a thermally conductive structure that includes, among other features, a plurality of thermally conductive fibers embedded in an adhesive and having first portions extending upwardly out of the adhesive, and an encapsulant between the first portions of the fibers and over the adhesive, the tips of the fibers extending to above the encapsulant. As can be readily appreciated from the discussion above regarding claims 32 and 35 and the deficiencies of the Koon references, such references do not disclose or suggest the subject matter of claim 37. Claim 38-41 depend from claim 37 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested.

Claim 42 sets forth a thermally conductive structure that includes, among other features, a plurality of flocked, thermally conductive fibers embedded in a layer of adhesive and having first portions that extend upwardly out of the adhesive, an encapsulant between the first portions and over the adhesive, and a third surface defining an outermost surface of the thermally conductive structure except for the fiber first portions terminating in tips above the third surface and the encapsulant. As can be readily appreciated from Applicants' assertions herein, claim 42 is patentable over both Koon references considered alone or in combination. Claims 43 and 44 depend from claim 42 and are also patentable at least for such reason.

Claim 45 sets forth a thermally conductive structure that includes, among other features, a plurality of flocked, thermally conductive fibers embedded in a layer of adhesive, the fibers having first portions that extend upwardly out of the adhesive, and an encapsulant over the adhesive, between the first portions of the fibers, and beneath free tips of the fibers. As can be readily appreciated from the discussion herein regarding the deficiencies of the Koon references, claim 45 is patentable over such references.

Claim 46 sets forth a method of making a thermal interface that includes, among other features, combining an encapsulant with a plurality of thermally conductive fibers, encapsulating a portion of the individual lengths of the plurality of fibers, an average length of the fibers being greater than an average thickness of the encapsulant, and forming a thermally conductive composite from the encapsulant and the fibers. As can be readily appreciated from the discussion herein regarding claim 32 and the

deficiencies of the Koon references, claim 46 is patentable over such references. In particular, the references do not expressly or inherently disclose or suggest how to encapsulate the fibers as claimed. Claim 47 depends from claim 46 and is patentable at least for such reason.

Claim 48 sets forth a method of making a thermal interface that includes, among other features, embedding a plurality of thermally conductive fibers in a support material, the fibers having first portions that extend upwardly out of the support material, applying an encapsulant between the first portions of the fibers and over the support material, and forming a third surface defining an outermost surface of the thermally conductive composite except for the fiber first portions terminating in tips that are elevationally above the third surface and the encapsulant. As can be readily appreciated from the discussion herein regarding claims 32 and 35 and the deficiencies of the Koon references, claim 48 is patentable over such references. In particular, the references do not expressly or inherently disclose or suggest how to apply the encapsulant as claimed.

Claims 54 and 55 depend from claim 48 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. For example, claim 54 sets forth that the encapsulant comprises a gel. Neither of the Koon references disclose or suggest such an encapsulant. Also for example, claim 55 sets forth that the first surface of the support material opposes the third surface of the thermal interface and defines another outermost surface of the thermally conductive composite except for fiber tips, if any, that terminate elevationally

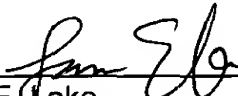
below the support material. Also, an average length of the fibers is greater than an average thickness from the first surface to the third surface. Neither of the cited references disclose or suggest applying encapsulant in a manner yielding the claimed relationship between average fiber length and average thickness between the outermost surfaces.

At least for the reasons asserted herein, claims 32-55 are patentable over Koon '548 in view of Koon '707. All pending claims are thus in condition of allowance and Applicants request such allowance in the next Office Action.

Applicants previously submitted a two-page Form PTO 1449 in an Information Disclosure Statement dated November 16, 2001. One of the pages was returned with the Examiner's initials, but Applicants did not receive an initialed copy of the other page listing the Johnson and Knauf references. Applicants request a copy of the initialed form in the next Office Action.

Respectfully submitted,

Dated: 19 Jul 2002

By: 
James E. Lake
Reg. No. 44,854

Appl. No. 09/333,564



Application Serial No. 09/333,564
Filing Date June 21, 1999
Inventor..... Nancy F. Dean, et al
Assignee..... Honeywell International Inc.
Group Art Unit..... 3743
Examiner C. Juska
Attorney's Docket No. JM34806US
Title: Compliant Fibrous Thermal Interface

VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING
PRELIMINARY AMENDMENT TO ACCOMPANY RCE

In the Claims

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

49. (amended) The interface of claim 33 wherein the encapsulant and support material have ~~a combined thickness encapsulating~~ together encapsulate fibers beyond one end of the individual lengths of the plurality of fibers.

50. (amended) The interface of claim 33 wherein the encapsulant and support material have a combined thickness encapsulating ~~at least~~ approximately 85% of the individual lengths of the plurality of fibers.

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